

**CARRIER BASED ON GRANULES PRODUCED  
FROM PYROGENICALLY PREPARED SILICON DIOXIDES**

[0001] The present invention relates to the use of granules of pyrogenic silica as carriers. In addition to various other actions, the granules can have the function of a carrier for foodstuffs additives, such as dyestuffs, antioxidants, preservatives, emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives, chemical intermediates and plant protection agents, such as, for example, herbicides, insecticides, fungicides and others.

[0002] It is known to employ spherical silicon dioxide particles as carriers, for example for feedstuffs additives (Sipernat 22, Bulletin Pigments No. 31, "Synthetic Silica as a Flow Acid and Carrier Substance", Degussa AG).

[0003] Disadvantages of the abovementioned silicon dioxide particles which are employed as carriers are their high water content, their too low purity and the poor flow properties of the loaded substance. Silicic acid esters, silica sols or silicates are employed as starting compounds, and then often lead to products of which the purity is not adequate for the desired intended uses because of considerable amounts of salts, so that an expensive washing is necessary.

[0004] The invention is therefore based on the object of providing spherical silicon dioxide particles for use as carriers which do not have the disadvantages mentioned and moreover meet the high demands of uses in respect of purity, product safety and flow properties.

[0005] The invention provides the use of granules based on pyrogenically prepared silicon dioxide as a carrier for substances chosen from the group consisting of foodstuffs

additives, such as dyestuffs, antioxidants, preservatives, emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives, chemical intermediates and plant protection agents, such as herbicides, insecticides, fungicides and others.

**[0006]** The invention also provides an adsorbate of granules based on pyrogenically prepared silicon dioxide and at least one substance chosen from the group consisting of foodstuffs additives, such as dyestuffs, antioxidants, preservatives, emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives, chemical intermediates and plant protection agents, such as herbicides, insecticides and fungicides.

**[0007]** The granules based on pyrogenically prepared silicon dioxide preferably have an average particle diameter of 10 to 120  $\mu\text{m}$  and a BET surface area of 40 to 400  $\text{m}^2/\text{g}$  (determination in accordance with DIN 66 131 with nitrogen).

**[0008]** The silicon dioxide granules furthermore preferably have the following physico-chemical characteristic data, which are determined as described in EP PS 0 725 037:

Pore volume: 0.5 to 2.5  $\text{ml/g}$

Pore size distribution: less than 5% of the total pore volume has a pore diameter of less than 5 nm, remainder meso- and macropores

pH: 3.6 to 8.5

Tamped density: 220 to 700  $\text{g/l}$ .

**[0009]** Granules which are suitable for the use according to the invention and the preparation thereof are described, for example, in EP OS 0 727 037.

**[00010]** The granules can preferably have meso- and macropores, the volume of the mesopores making up 10 to 80% of the total volume. The particle size distribution of the granules is preferably 80 vol.% larger than 8  $\mu\text{m}$  and 80 vol.% smaller than 96  $\mu\text{m}$ . In a preferred embodiment of the invention, the content of pores smaller than 5  $\mu\text{m}$  is not more than 5%, based on the total pore volume.

**[00011]** The granules employed according to the invention can be prepared, for example, by dispersing pyrogenically prepared silicon dioxide, preferably silicon dioxide prepared from silicon tetrachloride by means of flame hydrolysis, in water, spray drying the dispersion and optionally then heat-treating the resulting granules at a temperature of 150 to 1,100°C for a period of 1 to 8 h.

**[00012]** The dispersion in water preferably has a concentration of silicon dioxide of 5 to 25 wt.%, more preferably 5 to about 19.9 wt.%. The spray drying can be carried out at a temperature of 200 to 600°C, and disc atomizers or nozzle atomizers can be employed in this context. The heat treatment of the granules can be carried out either in a static bed, such as, for example, in chamber ovens, or in an agitated bed, such as, for example, rotary tubular dryers.

**[00013]** The pyrogenic silicon dioxide serving as the starting compound is prepared by a process in which a volatile silicon compound is injected into an oxyhydrogen gas flame of hydrogen and air. Silicon tetrachloride is used in most cases. This substance hydrolyses to silicon dioxide and hydrochloric acid under the influence of the water formed during the oxyhydrogen gas reaction. After leaving the flame the silicon dioxide enters into a so-called coagulation zone, in which the silicon dioxide primary particles and primary aggregates agglomerate. The product present as a type of aerosol in this stage is separated from the gaseous concomitant substances in

cyclones and then after-treated with damp hot air. The residual hydrochloric acid content can be lowered to below 0.025% by this process.

**[00014]** The granules based on pyrogenically prepared silicon dioxide can be silanized. The carbon content of the granules is then preferably 0.3 to 15.0 wt.%. Halogenosilanes, alkoxysilanes, silazanes and/or siloxanes can be employed for the silanization.

**[00015]** The following substances can be employed in particular as halogenosilanes:

Halogeno-organosilanes of the type  $X_3Si(C_nH_{2n+1})$

$X = Cl, Br$

$n = 1 - 20$

Halogeno-organosilanes of the type  $X_2(R')Si(C_nH_{2n+1})$

$X = Cl, Br$

$R' = \text{alkyl}$

$n = 1 - 20$

Halogeno-organosilanes of the type  $X(R')_2Si(C_nH_{2n+1})$

$X = Cl, Br$

$R' = \text{alkyl}$

$n = 1 - 20$

Halogeno-organosilanes of the type  $X_3Si(CH_2)_m-R'$

$X = Cl, Br$

$m = 0, 1 - 20$

$R' = \text{alkyl, aryl (e.g. } -C_6H_5)$

$-C_4F_9, -OCF_2-CHF-CF_3, -C_6F_{13}, -O-CF_2-CHF_2$

$-NH_2, -N_3, -SCN, -CH=CH_2,$

$-OOC(CH_3)C=CH_2$

$-OCH_2-CH(O)CH_2$

$—NH—CO—N—CO—(CH_2)_5—$

$-NH-COO-CH_3, -NH-COO-CH_2-CH_3, -NH-(CH_2)_3Si(OR)_3$

$-S_x-(CH_2)_3Si(OR)_3$

Halogeno-organosilanes of the type  $(R)X_2Si(CH_2)_m-R'$

$X = \text{Cl, Br}$   
 $R = \text{alkyl}$   
 $m = 0, 1 - 20$   
 $R' = \text{alkyl, aryl (e.g. } -\text{C}_6\text{H}_5\text{)}$   
 $-\text{C}_4\text{F}_9, -\text{OCF}_2-\text{CHF}-\text{CF}_3, -\text{C}_6\text{F}_{13}, -\text{O}-\text{CF}_2-\text{CHF}_2$   
 $-\text{NH}_2, -\text{N}_3, -\text{SCN}, -\text{CH}=\text{CH}_2,$   
 $-\text{OOC}(\text{CH}_3)\text{C}=\text{CH}_2$   
 $-\text{OCH}_2-\text{CH}(\text{O})\text{CH}_2$   
 $\text{---NH---CO---N---CO---}(\text{CH}_2)_5\text{---}$   
 $-\text{NH}-\text{COO}-\text{CH}_3, -\text{NH}-\text{COO}-\text{CH}_2-\text{CH}_3, -\text{NH}-(\text{CH}_2)_3\text{Si}(\text{OR})_3$   
 $-\text{S}_x-(\text{CH}_2)_3\text{Si}(\text{OR})_3$

Halogeno-organosilanes of the type  $(R)_2X \text{ Si}(\text{CH}_2)_m\text{R}'$

$X = \text{Cl, Br}$   
 $R = \text{alkyl}$   
 $m = 0, 1 - 20$   
 $R' = \text{alkyl, aryl (e.g. } -\text{C}_6\text{H}_5\text{)}$   
 $-\text{C}_4\text{F}_9, -\text{OCF}_2-\text{CHF}-\text{CF}_3, -\text{C}_6\text{F}_{13}, -\text{O}-\text{CF}_2-\text{CHF}_2$   
 $-\text{NH}_2, -\text{N}_3, -\text{SCN}, -\text{CH}=\text{CH}_2,$   
 $-\text{OOC}(\text{CH}_3)\text{C}=\text{CH}_2$   
 $-\text{OCH}_2-\text{CH}(\text{O})\text{CH}_2$   
 $\text{---NH---CO---N---CO---}(\text{CH}_2)_5\text{---}$   
 $-\text{NH}-\text{COO}-\text{CH}_3, -\text{NH}-\text{COO}-\text{CH}_2-\text{CH}_3, -\text{NH}-(\text{CH}_2)_3\text{Si}(\text{OR})_3$   
 $-\text{S}_x-(\text{CH}_2)_3\text{Si}(\text{OR})_3$

**[00016]** The following substances can be employed in particular as alkoxysilanes:

Organosilanes of the type  $(\text{RO})_3\text{Si}(\text{C}_n\text{H}_{2n+1})$

$R = \text{alkyl}$   
 $n = 1 - 20$

Organosilanes of the type  $\text{R}'_x(\text{RO})_y\text{Si}(\text{C}_n\text{H}_{2n+1})$

$R = \text{alkyl}$   
 $R' = \text{alkyl}$   
 $n = 1 - 20$   
 $x+y = 3$   
 $x = 1, 2$   
 $y = 1, 2$

Organosilanes of the type  $(\text{RO})_3\text{Si}(\text{CH}_2)_m\text{-R}'$

R = alkyl

m = 0, 1 – 20

R' = alkyl, aryl (e.g.  $-\text{C}_6\text{H}_5$ )

$-\text{C}_4\text{F}_9$ ,  $-\text{OCF}_2\text{-CHF-CF}_3$ ,  $-\text{C}_6\text{F}_{13}$ ,  $-\text{O-CF}_2\text{-CHF}_2$

$-\text{NH}_2$ ,  $-\text{N}_3$ ,  $-\text{SCN}$ ,  $-\text{CH=CH}_2$ ,

$-\text{OOC}(\text{CH}_3)\text{C}=\text{CH}_2$

$-\text{OCH}_2\text{-CH(O)CH}_2$

$\text{—NH—CO—N—CO—(CH}_2)_5\text{—}$

$-\text{NH-COO-CH}_3$ ,  $-\text{NH-COO-CH}_2\text{-CH}_3$ ,  $-\text{NH-(CH}_2)_3\text{Si(OR)}_3$

$-\text{S}_x\text{-(CH}_2)_3\text{Si(OR)}_3$

Organosilanes of the type  $(\text{R}'')_x(\text{RO})_y\text{Si}(\text{CH}_2)_m\text{-R}'$

R'' = alkyl

x+y = 2

x = 1, 2

y = 1, 2

R' = alkyl, aryl (e.g.  $-\text{C}_6\text{H}_5$ )

$-\text{C}_4\text{F}_9$ ,  $-\text{OCF}_2\text{-CHF-CF}_3$ ,  $-\text{C}_6\text{F}_{13}$ ,  $-\text{O-CF}_2\text{-CHF}_2$

$-\text{NH}_2$ ,  $-\text{N}_3$ ,  $-\text{SCN}$ ,  $-\text{CH=CH}_2$ ,

$-\text{OOC}(\text{CH}_3)\text{C}=\text{CH}_2$

$-\text{OCH}_2\text{-CH(O)CH}_2$

$\text{—NH—CO—N—CO—(CH}_2)_5\text{—}$

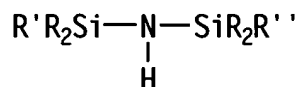
$-\text{NH-COO-CH}_3$ ,  $-\text{NH-COO-CH}_2\text{-CH}_3$ ,  $-\text{NH-(CH}_2)_3\text{Si(OR)}_3$

$-\text{S}_x\text{-(CH}_2)_3\text{Si(OR)}_3$

**[00017]** The silane Si 108  $[(\text{CH}_3\text{O})_3\text{-Si-C}_8\text{H}_{17}]$  trimethoxyoctylsilane can preferably be employed as the silanizing agent.

[00018] The following substances can be employed in particular as silazanes:

Silazanes of the type:



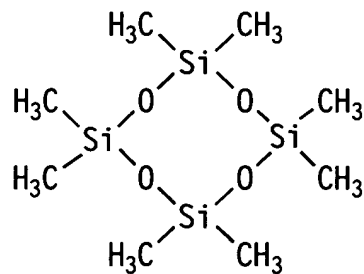
R = alkyl

R' = alkyl, vinyl

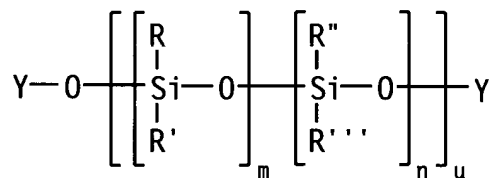
and, for example, hexamethyldisilazane.

[00019] The following substances can be employed in particular as siloxanes:

Cyclic polysiloxanes of the type D 3, D 4, D 5, e.g.  
octamethylcyclotetrasiloxane = D 4



Polysiloxanes or silicone oils of the type:



R = alkyl, aryl,  $(\text{CH}_2)_n - \text{NH}_2$ , H

R' = alkyl, aryl,  $(\text{CH}_2)_n - \text{NH}_2$ , H

R'' = alkyl, aryl,  $(\text{CH}_2)_n - \text{NH}_2$ , H

R''' = alkyl, aryl,  $(\text{CH}_2)_n - \text{NH}_2$ , H

Y =  $\text{CH}_3$ , H,  $\text{C}_n\text{H}_{2n+1}$  where  $n=1-20$

Y =  $\text{Si}(\text{CH}_3)_3$ ,  $\text{Si}(\text{CH}_3)_2\text{H}$

$\text{Si}(\text{CH}_3)_2\text{OH}$ ,  $\text{Si}(\text{CH}_3)_2(\text{OCH}_3)$

$\text{Si}(\text{CH}_3)_2(\text{C}_n\text{H}_{2n+1})$  where  $n=1-20$

$m = 0, 1, 2, 3, \dots \infty$

$$n = 0,1,2,3,\dots\infty$$

$$u = 0,1,2,3,\dots\infty$$

**[00020]** The silanization can be carried out by a procedure in which the granules are sprayed with the silanizing agent, which can optionally be dissolved in an organic solvent, such as, for example, ethanol, and the mixture is then heat-treated at a temperature of 105 to 400°C over a period of 1 to 6 h.

**[00021]** An alternative method of the silanization of the granules can be carried out by a procedure in which the granules are treated with the silanizing agent in vapour form and the mixture is then heat-treated at a temperature of 200 to 800°C over a period of 0.5 to 6 h. The heat treatment can be carried out under an inert gas, such as, for example, nitrogen.

**[00022]** The silanization can be carried out continuously or batchwise in heatable mixers and dryers with spray devices. Suitable devices can be, for example: plough share mixers or plate, fluidized bed or flow-bed dryers.

**[00023]** By varying the starting substances, the conditions during spraying, the heat treatment and the silanization, the physico-chemical parameters of the granules, such as the specific surface area, the particle size distribution, the pore volume, the tamped density and the silanol group concentration, pore distribution and pH, can be modified within the stated limits.

**[00024]** The invention also provides:

- a. Dyestuff comprising granules based on pyrogenically prepared silicon dioxide.
- b. Antioxidant comprising granules based on pyrogenically prepared silicon dioxide.
- c. Preservative comprising granules based on pyrogenically prepared silicon dioxide.



- d. Emulsifier comprising granules based on pyrogenically prepared silicon dioxide.
- e. Gelling agent comprising granules based on pyrogenically prepared silicon dioxide.
- f. Thickener comprising granules based on pyrogenically prepared silicon dioxide.
- g. Binder comprising granules based on pyrogenically prepared silicon dioxide.
- h. Stabilizer comprising granules based on pyrogenically prepared silicon dioxide.
- i. Alkali comprising granules based on pyrogenically prepared silicon dioxide.
- j. Acids comprising granules based on pyrogenically prepared silicon dioxide.
- k. Salts comprising granules based on pyrogenically prepared silicon dioxide.
- l. Antilumping agent comprising granules based on pyrogenically prepared silicon dioxide.
- m. Flavour intensifier comprising granules based on pyrogenically prepared silicon dioxide.
- n. Sweetener comprising granules based on pyrogenically prepared silicon dioxide.
- o. Aroma comprising granules based on pyrogenically prepared silicon dioxide.
- p. Feedstuffs additives comprising granules based on pyrogenically prepared silicon dioxide.
- q. Chemical intermediates comprising granules based on pyrogenically prepared silicon dioxide.

- r. Plant protection agents comprising granules based on pyrogenically prepared silicon dioxide.
- s. Herbicides comprising granules based on pyrogenically prepared silicon dioxide.
- t. Insecticides comprising granules based on pyrogenically prepared silicon dioxide.
- u. Fungicides comprising granules based on pyrogenically prepared silicon dioxide.

[00025] Foodstuffs additives can be:

Dyestuffs, such as, for example:

E100 Curcumin  
 E101 Riboflavin, Lactoflavin  
 E102 Tartrazine  
 E104 Quinoline Yellow  
 E110 Sunset Yellow S (azo dyestuff)  
 E120 Carminic acid, Cochineal  
 E122 Azorubine (azo dyestuff)  
 E123 Amaranth (azo dyestuff)  
 E124 Ponceau 4R (azo dyestuff)  
 E127 Erythrosine  
 E131 Patent Blue V  
 E132 Indigotine, Indigo Carmine  
 E140 Chlorophylls a + b  
 E141 Chlorophylls und Chlorophyllins, copper complexes  
 E142 Acid Brilliant Green BS  
 E150 Caramel, Sugar colour, Rum colour  
 E151 Brilliant Black BN (azo dyestuff)  
 E153 Charcoal, medicinal  
 E160 Carotenoids  
 E160a Beta-Carotene, Gamma-Carotene  
 E160b Bixin, Norbixin, (Annatto), Orlean  
 E160c Capsanthin, Capsorubin  
 E160d Lycopene  
 E160e Beta-Apo-8'-Carotenal (C30)  
 E160f Beta-Apo-8'-Carotenoic Acid Ethyl Ester  
 E161 Xanthophylls  
 E161a Flavoxanthin  
 E161b Lutein

E161c Cryptoxanthin  
 E161d Rubixanthin  
 E161e Violaxanthin  
 E161f Rhodoxanthin  
 E161g Canthaxanthin  
 E162 Betanin, Beetroot Red  
 E163 Anthocyan  
 E172 Iron oxide, iron hydroxide  
 E173 Aluminium  
 E174 Silver  
 E175 Gold  
 E180 Pigment Rubine BK, Lithol Rubine

Antioxidants can be:

E220 Sulfurous acid, sulfur dioxide  
 E221 Sodium sulfite  
 E222 Sodium hydrogen sulfite  
 E223 Sodium disulfite  
 E224 Potassium disulfite  
 E300 Ascorbic acid  
 E301 Sodium ascorbate  
 E302 Calcium ascorbate  
 E304 Ascorbyl palmitate  
 E306 Tocopherol-containing extracts of natural origin  
 E307 alpha-Tocopherol  
 E308 gamma-Tocopherol  
 E309 delta-Tocopherol  
 E310 Propyl gallate  
 E311 Octyl gallate  
 E312 Dodecyl gallate  
 E320 Butylhydroxyanisole (BHA)  
 E321 Butylhydroxytoluene (BHT)  
 E330 Citric acid  
 E331 Sodium citrate  
 E332 Potassium citrate  
 E333 Calcium citrate  
 E472c Citric acid esters

Ethoxiquin

Preservatives can be:

E200 Sorbic acid  
 E201 Sodium sorbate  
 E202 Potassium sorbate  
 E203 Calcium sorbate  
 E210 Benzoic acid

E211 Sodium benzoate  
E212 Potassium benzoate  
E213 Calcium benzoate  
E214 Ethyl 4-hydroxybenzoate  
E215 Ethyl 4-hydroxybenzoate, sodium salt  
E216 Propyl 4-hydroxybenzoate  
E217 Propyl 4-hydroxybenzoate, sodium salt  
E218 Methyl 4-hydroxybenzoate  
E219 Methyl 4-hydroxybenzoate, sodium salt  
E220 Sulfurous acid, sulfur dioxide  
E221 Sodium sulfite  
E222 Sodium hydrogen sulfite  
E223 Sodium disulfite  
E224 Potassium disulfite  
E236 Formic acid  
E280 Propionic acid  
E281 Sodium propionate  
E282 Calcium propionate  
E283 Potassium propionate

Emulsifiers can be:

E322 Lecithin  
E442 Ammonium salts of phosphatidic acids  
E471 Edible fatty acids, mono- and diglycerides  
E472 Esters of E471  
E472a Acetic acid esters  
E472b Lactic acid esters  
E472c Citric acid esters  
E472d Tartaric acid esters  
E472e Diacetyltartaric acid esters  
E472f Tartaric-acetic acid esters  
E473 Sucrose esters of edible fatty acids  
E474 Sugar glycerides  
E475 Polyglycerol esters of edible fatty acids  
E476 Polyglycerol esters of polycondensed ricinoleic acid  
E477 Propylene glycol esters of edible fatty acids  
E481 Sodium stearylactylate  
E482 Calcium stearylactylate  
E487 Sodium lauryl sulfate

**[00026]** Gelling agents, thickeners and binders and stabilizers can be:

E400 Alginic acid  
E401 Sodium alginate  
E402 Potassium alginate  
E403 Ammonium alginate

- E404 Calcium alginate
- E405 Propylene glycol alginate
- E406 Agar-agar
- E407 Carrageenan
- E410 Carob bean flour
- E412 Guar flour
- E413 Tragacanth
- E414 Gum arabic
- E415 Xanthan
- E416 Karaya gum
- E417 Tara gum
- E440 Pectins
- E460a Cellulose, microcrystalline
- E460b Cellulose, powdered
- E461 Methylcellulose
- E463 Hydroxypropylcellulose
- E464 Hydroxypropylmethycellulose
- E465 Methylethylcellulose
- E466 Carboxymethylcellulose
- E551 Silicon dioxide
- E1411 Di-starch phosphate I
- E1412 Di-starch phosphate II
- E1413 Di-starch phosphate, phosphated
- E1414 Di-starch phosphate, acetylated
- E1420 Mono-starch acetate I
- E1421 Mono-starch acetate II
- E1422 Di-starch adipate, acetylated
- E1423 Di-starch glycerol, acetylated
- E1430 Di-starch glycerol
- E1440 Hydroxypropyl-starch
- E1441 Hydroxypropyl-di-starch glycerol
- E1442 Hydroxypropyl-di-starch phosphate

**[00027]** Alkalies, acids and salts can be:

- E170 Calcium carbonate
- E260 Acetic acid
- E261 Potassium acetate
- E262 Sodium diacetate
- E263 Calcium diacetate
- E270 Lactic acid
- E296 Malic acid
- E325 Sodium lactate
- E326 Potassium lactate
- E327 Calcium lactate

E330 Citric acid  
E331 Sodium citrate  
E332 Potassium citrate  
E333 Calcium citrate  
E334 Tartaric acid  
E335 Sodium tartrate  
E336 Potassium tartrate  
E337 Potassium sodium tartrate  
E354 Calcium tartrate  
E338 Orthophosphoric acid  
E339 Sodium orthophosphate  
E340 Potassium orthophosphate  
E341 Calcium orthophosphate  
E343 Magnesium orthophosphate  
E350 Sodium malate  
E351 Potassium malate  
E352 Calcium malate  
E450 Salts of di-, tri- and polyphosphoric acid (di-, tri- and polyphosphates)  
E500 Sodium carbonate  
E501 Potassium carbonate  
E503 Ammonium carbonate  
E504 Magnesium carbonate  
E507 Hydrochloric acid  
E508 Potassium chloride  
E509 Calcium chloride  
E510 Ammonium chloride  
E514 Sodium sulfate  
E515 Potassium sulfate  
E516 Calcium sulfate  
E524 Sodium hydroxide  
E525 Potassium hydroxide  
E526 Calcium hydroxide  
E527 Ammonium hydroxide  
E528 Magnesium hydroxide  
E529 Calcium oxide  
E530 Magnesium oxide  
E541 Sodium aluminium phosphate  
E574 Gluconic acid  
E575 Glucono-delta-lactone  
E576 Sodium gluconate  
E577 Potassium gluconate  
E578 Calcium gluconate

**[00028]** Antilumping agents can be:  
E170 Calcium carbonate  
E341 Calcium orthophosphate  
E470 Edible fatty acids, sodium, potassium and calcium salts  
E504 Magnesium carbonate  
E535 Sodium ferrocyanide  
E536 Potassium ferrocyanide  
E538 Calcium ferrocyanide

**[00029]** Flavour intensifiers can be:  
E621 Sodium glutamate  
E622 Potassium glutamate  
E623 Calcium glutamate  
E624 Magnesium glutamate  
E625 Ammonium glutamate  
E627 Sodium guanylate  
E628 Potassium guanylate  
E629 Calcium guanylate  
E630 5'-Inosinic acid  
E631 Sodium inosinate  
E632 Potassium inosinate  
E633 Calcium inosinate

**[00030]** Sweeteners can be:  
E950 Acesulfame-K  
E951 Aspartame  
E952 Cyclamate  
E954 Saccharin  
E957 Thaumatin

**[00031]** Aromas:  
Abriceine  
Acetanisol crystalline  
Acetophenone pure  
Agar wood D50092NS  
Agrumen aldehyde 6947L  
Agrumex HC  
Agrumex LC  
Agrumover 10897 C/J  
Aldehyde C 6 natural  
Aldehyde C11 MOA  
Aldehyde C12 MNA  
Aldehyde C14 so-called  
Aldehyde C16 so-called

Aldehyde C18 so-called/Abricolin  
Alcohol C 6 nat.  
Alcohol C 8  
Alcohol C 9  
Alcohol C10  
Alcohol C12  
Allinat/Allyl isothiocyanate  
Allinat/Allyl isothiocyanate (stab.)  
Allyl caproate  
Allyl caproate kosher  
Allyl cyclohexylpropionate  
Allyl heptylate  
Allyl phenoxyacetate  
Amarocit ®  
Ambre 83LN DB10028  
Ambrebois D50407  
Ambrettia C  
Ambrettolide  
Ambrinol S  
Ambroxid cryst.  
Ananas Coeur D50214  
Anethol NPU 21/22°C  
Anethol supra 21.5°C  
Anisaldehyde pure  
Anisyl alcohol  
Anisole  
Anisyl acetate  
Apple 74180C PM  
Apriconia 28855P extra PM  
Baldrian Identoil B  
Basilicum Synthessence  
Bay Identoil  
Benzalacetone  
Benzaldehyde  
Benzaldehyde dd  
Benzophenone cryst.  
Benzyl acetate  
Benzyl acetone  
Benzyl alcohol dd  
Benzyl alcohol FR  
Benzyl benzoate H&R  
Benzyl benzoate M  
Benzyl cinnamate  
Benzyl formate



Benzyl propionate  
Benzyl salicylate  
Bergamot Identoil colourless  
Bergamot Synthessence Afric.  
Blackberry D50260E  
Bois de Cachemire D50008  
Bois Doux 78008SP PM  
Boronal  
Butyric acid nat.  
Butyl butyrate  
Cacao et Chocolat D50546B  
Cajeput Identoil  
Calmus Synthessence asarone-free  
Cananga Identoil  
Capric acid nat.  
Caproic acid nat.  
Caramel acetate  
Cardamom R Identoil  
Cardamom Synthessence  
Cassia Identoil  
Cassia Identoil B dark  
Cassis D50060B  
Cedar Leaves Identoil  
Chloracetophenone para  
Chrysantheme  
Cinnamyl acetate  
Cital FF  
Citron R  
Citron Synthessence FF  
Citronella Identoil  
Citronell Identoil  
Citronellyl tiglinat  
Citronitrile  
Citrowanil® B  
Citrozone D50620B  
Citrylal  
Citrylal E  
Clarifruit D50757  
Clarion Base D50774  
Coriander Identoil  
Corps 98N DB10025  
Corps Racine VS  
Costus Synthessence  
Coumarone

Cumin Synthessence  
 Cypress Identoil  
 Damascenone beta nat. 1% in EtOH  
 Datilat  
 Decalactone gamma nat.  
 Decalyl acetate beta  
 Diacetyl nat.  
 Dibenzosuberone  
 Dibenzosuberone  
 Dibenzyl ether  
 Diethyl phthalate (DEP)  
 Dihydrocoumarin  
 Dimethyl anthranilate  
 Dimethyl benzyl carbinyl butyrate  
 Dimethyl sulfide nat.  
 Diphenyl oxide  
 Silver Fir Needle Identoil  
 Silver Fir Needle Identoil B  
 Oak Moss Resin D50342  
 Strawberry D50026C  
 Acetic acid nat.  
 Estragon Identoil  
 Ethoxyfuranone  
 Ethyl 2-methylbutyrate nat.  
 Ethyl 2-methylbutyrate  
 Ethyl acetate nat.  
 Ethyl acetoacetate  
 Ethyl benzoate  
 Ethyl butyrate  
 Ethyl butyrate nat.  
 Ethyl caproate kosher  
 Ethyl caproate nat.  
 Ethyl caprylate  
 Ethyl caprylate nat.  
 Ethyl cinnamate  
 Ethyl formate  
 Ethyl heptylate  
 Ethyl isovalerate  
 Ethyl phenylacetate  
 Ethyl propionate  
 Ethyl salicylat  
 Eucalyptol  
 Eucalyptus Oil Globulus BP  
 Eugenol

Eugenol methyl ether  
Farenal  
Fennel oil techn.  
Feuilles de Tomate 79569PM  
Spruce Green 8001S  
Spruce Needle Identoil B sib.  
Spruce Needle Identoil sib.  
Filbertone G  
Fir Balsam DM  
Fleur de Cassis SBU PM  
Floropal  
Florophyll 10183  
Fragolane  
Framboson 10583F  
Frutinat  
Galbanum Synthessence  
Galbanum Synthresin B  
Geranium Identoil Afric.  
Geranium Identoil Bourbon  
Geranyl tiglate  
Globalide 100%  
Globanone 50% DEP  
Globanone 50% DPG  
Globanone 50% IPM  
Grapefruit D50075N  
Grapefruit Identoil D61286G  
Green Honey Melon D50315  
Guave 10875N  
Helichrysum Synthessence  
Herbaflorat  
Hexyl acetate  
Hexyl acetate nat.  
Hexyl salicylate  
Hydrocitronitrile  
Indian Spice 10898  
Indoflor H&R cryst.  
Indole FF  
Ginger oil spec. D40393S  
Ionone pure 100%  
Iris Synthresin H&R  
Irolene P  
Isoamyl acetate G  
Isoamyl acetate nat.  
Isoamyl butyrate

Isoamyl butyrate nat.  
Isoamyl isobutyrate nat.  
Isoamyl isovalerate  
Isoananate  
Isobornyl acetate  
Isobutyric acid nat.  
Isobutyl acetat nat.  
Isobutylquinoline  
Isobutylquinoline 54  
Isoeugenol methyl ether  
Isotabac naturelle LN DB10038  
Jasmaprunat  
Camomile Identoil blue  
Camomile rom. Synthessence  
Pine Needle Identoil  
Pine Needle Identoil B  
Pine Needle Identoil B P  
Kiwi D50195PM  
Cresol methyl ether para  
Lactojasmon  
Lavandin Identoil 30/32%  
Lavandin Identoil type French 30/32%  
Lavandin Provence D50817  
Lavender Identoil type Mt. Blanc 40/42%  
Lavender oil type Mt. Blanc 40/42%  
Leguminal  
Limonene d pure  
Loganberry D50398N PM  
Bay Leaf Oil D50286  
Mace Oil extra  
Macrolide®  
Macrolide® supra  
Madranol  
Magnolan  
Majantol  
Mandaril  
Manderine Synthessence  
Mango D50436PM  
Maracuja D50042E PM  
Marjoliane N DB10018  
Mayciane N DB10023  
Melissa Identoil German so-called  
Menthol D dist.  
Menthol liquid

Menthol rac.  
 Menthol rac. PH  
 Menthol-l dest.  
 Menthol-l H&R compacted  
 Menthol oil  
 Menthone-l/Isomenthone-d  
 Menthyl acetate-l  
 Metaxa D50247C  
 Methyl ethylpyrazine-2,3  
 Methyl 2-methylbutyrate  
 Methylacetophenone para  
 Methylacetophenone para supra  
 Methyl anthranilate  
 Methyl benzoate H&R  
 Methyl benzoate techn. pure  
 Methyl betanaphthyl ketone cryst. Methylbutyric acid-2 nat.  
 Methyl cinnamate  
 Methyl phenylacetate  
 Methyl salicylate  
 Methyl cinnamaldehyde alpha  
 Miel Blanc N DB10024  
 Musk Seed Synthessence  
 Mugetanol  
 Mugofleur D50444PM  
 Clary Sage Identoil  
 Clary Sage Identoil B  
 Carnation Flower Identoil  
 Clove Leaf Identoil dark  
 Clove Leaf Oil deg.  
 Neononyl acetate  
 Neroli Identoil  
 Nerolin Yara Yara cryst.  
 Neroli oil 4663  
 Olibanum Synthresin  
 Orange Identoil TSA  
 Orange oil spec. D40393P  
 Origanum Identoil  
 Oryclon extra  
 Oryclon special  
 Osmanthia 353  
 Ozonil  
 Palisandal  
 Palisandin  
 Palmarosa Synthessence

Pastinak Synthessence  
Patchouli Synthessence N  
Patchouli oil deg. DM  
Pear D50313A PM  
Peru Balsam Identoil  
Peru balsam art. H&R  
Petitgrain Bigarade Synthessence  
Petitgrain Identoil R  
Peach D40110PM  
Plum D50424  
Phenirate  
Phenoxyethyl alcohol/aerosol  
Phenylacetaldehyde 100%  
Phenylacetaldehyde dimethyl acetal  
Phenylethyl acetate  
Phenylethyl alcohol benzyl alcohol-free  
Phenylethyl alcohol pure  
Phenylethyl cinnamate cryst.  
Phenylethyl isobutyrate  
Phenylethyl phenylacetate  
Phenylpropyl alcohol  
Pimento Identoil  
Pineapple acetate  
Poivre Coeur H&R PM  
Poivron N DB10029  
Prenyl acetate  
Prenyl salicylate  
Profarnesal  
Projasmon P  
Propionic acid nat.  
Propyl acetate nat.  
Prunol N DB10027  
Pyroprunat  
Rain Forest D50339C PM  
Resedafof  
Rosaphen  
Rose Booster D50221A  
Rose F50048R PG  
Rosemary Identoil  
Rosemary Identoil Spanish  
Rosewood Braz. Identoil  
Sage Identoil Span.  
Sage Identoil Span.  
Sandalwood S.E.A. D50820

Sandel 80  
Sandel extra  
Sandel Forte  
Sandel H&R  
Sandel H&R ECO  
Sandel H&R super  
Sandel SP  
Sandel type East Ind.  
Sandalwood type East Ind.  
Sandolene H&R  
Spike Identoil  
Styrax Identoil D50186  
Styrenyl acetate  
Sweet Amber D50807  
Tobacco aroma H&R D50799  
Teatree D50780A  
Thyme Identoil  
Thyme red Identoil  
Thyme Synthabsolue  
Thymol dist.  
Thymol cryst. H&R  
Thymol cryst. PH  
Tonca Synthresin  
Vanillin nat.  
Verbena Identoil type French  
Verdeflora D50375D  
Verdural F  
Vertocitral  
Vertocitral C  
Vertosine  
Vetiver Identoil J  
Juniper berry Identoil 10900  
Juniper berry Synthessence  
Willow fragrance 6103CB HG  
Wintergreen oil  
Ylang 10372 MT  
Ylang Ylang Identoil Bourbon I  
Ylang Ylang Identoil Bourbon II  
Ylang Ylang Identoil Bourbon III  
Cinnamaldehyde  
Cinnamaldehyde nat.  
Cinnamyl alcohol  
Cinnamon leaf Identoil  
Cinnamon bark Identoil

**[00032]** Feedstuffs additives can be:

- Choline chloride solution
- Vitamin E acetate
- Formic acid
- Acetic acid
- Propionic acid
- Phosphoric acid
- Fat concentrates
- Ethoxiquin
- Molasses
- Hop extract
- Tagetese extract
- Lecithin
- Whey
- Calcium formiate
- Urea
- Milk substitute
- Trace elements
- Vitamins

**[00033]** Chemical intermediates can be:

- 1,2-Propylene glycol
- Acrylic acid
- Adipic acid
- Adipic anhydride
- Formic acid
- Formic anhydride
- Benzoic acid
- Succinic acid
- Butanoic acid
- Butanoic anhydride
- Caproic acid
- Dimer fatty acid
- Dimer fatty acid anhydride
- Dipentaerythritol
- Erucic acid
- Acetic acid
- Acetic anhydride
- Ethylene glycol
- Fumaric acid
- Glutaric acid
- Glycerol
- Isophthalic acid



Isophthalic anhydride  
Lauric acid  
Linolenic acid  
Linoleic acid  
Maleic acid  
Maleic anhydride  
Malonic acid  
Myristic acid  
Oleic acid  
Oxalic acid  
Palmitic acid  
Pentaerythritol  
Phthalic acid  
Phthalic anhydride  
Propionic acid  
Stearic acid  
Terephthalic acid  
Terephthalic anhydride  
Trimethylolpropane  
Valeric acid  
Bisphenol A  
Epichlorohydrin  
o-Cresol  
Phenol novolaks  
Styrene  
 $\alpha$ -Methylstyrene  
Vinyltoluene  
Methyl methacrylate  
Divinylbenzene  
Diallyl phthalate  
Diisocyanates  
Toluene-diisocyanates  
Cyclohexanone  
Methylcyclohexanone  
Acetone  
Butanone  
Acetophenone  
Indene  
Coumarone (benzofuran)  
2-Methylindene  
2-Methylcoumarone  
Methylstyrene  
Cyclopentadiene  
Dicyclopentadiene

Heteropolysaccharides  
Arabinose  
Galactose  
Glucuronic acid  
Mannose  
Rhamnose  
Xylose  
Resinol acids  
Resinols  
Resinotannols  
Resenes  
Terpenes  
Diterpenes  
Triterpenes  
Sesquiterpenes  
Resin esters  
Resin soaps  
Alcohols  
Phenol derivatives  
Hydroquinone derivatives  
Quinoline derivatives  
Naturally occurring resins:  
Acaroid resin  
Asa foetida  
Benzoin resin  
Amber  
Bitumen  
Canada balsam  
China lacquer  
Copaiva balsam  
Dammar resin  
Dragon's blood resin  
Elemi  
Galbanum  
Gutti  
Jalap resin  
Japan lacquer  
Kauri copal  
Colophony  
Copal  
Labdanum  
Manila copal  
Mastix  
Myrrh

- Olibanum
- Opoponax
- Pernambuco balsam
- Peru balsam
- Sandarac
- Shellac
- Styrax
- Tolu balsam
- Terpentine
- Synthetic resins:
- Hydrocarbon resins
- Urea resins
- Alkyd resins
- Epoxy resins
- Melamine resins
- Melamine-formaldehyde resins
- Hexamethylolmelamine resins
- Melamine-phenol resins
- Melamine-urea resins
- Phenolic resins
- Polyester resins
- Unsaturated polyester resins
- Polyurethane resins
- Ketone resins
- Coumarone-indene resins
- Isocyanate resins
- Polyamide resins
- Terpene-phenol resins
- Epoxy resins
- Rubber

**[00034]** Additives:

- Wetting agents
- Desiccants
- Antifloating agents
- Antiskinning agents
- Hardening accelerators
- Hardening retardants
- Expanding agents
- Sealants
- Water softeners
- Deoxygenating agents
- Buffers
- Polishing agents
- Antiageing agents

Antioxidants  
Antiozonants  
Plasticizers  
Deodorizers  
Inhibitors  
Passivating agents  
Pickling inhibitors  
Anticorrosion agents  
Antistatics  
Stabilizers  
Release agents  
Lubricants  
Flameproofing agents  
UV absorbers  
Antiknocking agents  
Corrosion inhibitors  
Metal deactivators  
Carburettor cleaning agents  
Residue converters  
Antiicing agents  
Pour point depressors  
Defoamers  
Lubricity improvers  
Optical brighteners  
Antifoams:  
Anionic surfactants  
Polyethylene ethers  
Polypropylene glycol ethers  
Pluronic®  
Mixed ethers

[00035] Inorg. peroxides:  
Hydrogen peroxide  
Lithium peroxide  
Sodium peroxide  
Calcium peroxide  
Strontium peroxide  
Barium peroxide  
Org. peroxides:  
Di-tert-butyl peroxide  
Dibenzoyl peroxide  
Per-acids  
Per-acid esters  
Ketone peroxides

Epidioxides  
Ascaridol  
Ergosterol peroxide  
Stabilizers:  
Ethylenediaminetetraacetic acid  
Magnesium silicate  
Plasticizers:  
Camphor  
Trimellitic acid  
Phosphoric acid esters  
Azelaic acid esters  
Sebacic acid esters  
Chloroparaffins  
Dioctyl phthalate  
Bis-(2-ethylhexyl) phthalate  
Diisononyl phthalate  
Diisododecyl phthalate  
Phthalic acid esters  
Dibutyl phthalate  
Diisobutyl phthalate  
Dicyclohexyl phthalate  
Dimethyl phthalate  
Diethyl phthalate  
Benzyl butyl phthalate  
Butyl octyl phthalate  
Butyl deyl phthalate  
Dipentyl phthalate  
Dimethylglycol phthalate  
Dicapryl phthalate  
Trimellitic acid esters  
Tris-(2-ethylhexyl) trimellitate  
Dioctyl adipate  
Bis-(2-ethylhexyl) adipate  
Diisodecyl adipate  
Dibutyl sebacate  
Dioctyl sebacate  
Bis-(2-ethylhexyl) sebacate  
Azelaic acid  
Sebacic acid  
1,3-Butanediol  
1,2-Propanediol  
1,4-Butanediol  
1,6-Hexanediol  
Tricresyl phosphate

Triphenyl phosphate  
 Diphenyl cresyl phosphate  
 Diphenyl octyl phosphate  
 Bis-(2-ethylhexyl)diphenyl phosphate  
 Tris-(2-ethylhexyl) phosphate  
 Tris-(2-butoxyethyl) phosphate  
 Butyl oleate  
 Butyl stearate  
 Triethylene glycol bis-(2-ethylbutyrate)  
 Citric acid esters  
 Acetyltributyl citrate  
 Acetyltriethyl citrate  
 Tartaric acid esters  
 Lactic acid esters  
 Epoxystearic acid esters  
 Epoxidized soya oils  
 Linseed oils  
 Benzenesulfonamides  
 p-Toluenesulfonamides  
 Free radical interceptors:  
 Nitrogen monoxide  
 Bis(trifluoromethyl) nitroxide  
 Nitroxyl radicals  
 2,2-Diphenyl-1-picrylhydrazyl  
 Nitrosobenzene  
 2-Methyl-2-nitroso-propane  
 Benzaldehyde tert-butyl nitrone

[00036] Wetting agents can be:  
 Dimethyloctylphosphine oxide  
 Dimethylnonylphosphine oxide  
 Dimethyldecylphosphine oxide  
 Dimethylundecylphosphine oxide  
 Dimethyldodecylphosphine oxide  
 N,N-bis(3-D-gluconamidopropyl)cholamide  
 N,N-Bis(3-D-gluconamidopropyl)deoxycholamide  
 Dodecylpoly(oxyethylene glycol ether)s,  
 PEG (23) dodecyl ether,  
 PEG (10) cetyl alcohol  
 PEG (20) cetyl alcohol  
 PEG (10) stearyl alcohol  
 PEG (10) oleyl alcohol  
 PEG (29) oleyl alcohol  
 Polyethylene glycol (10) lauryl ether

Polyethylene glycol (8) dodecyl ether  
 Polyethylene glycol (10) isotridecyl ether  
 Polyethyleneglycol (15) isotridecylether  
 Ethylphenol-poly(ethylene glycol ether)s  
 Lubrol  
 Thesit  
 Thesit  
 Cetylpyridinium chloride  
 Cetyltrimethylammonium bromide  
 3-[(3-Cholamidopropyl)dimethylammonio]-1-propanesulfonic acid  
 3-[(3-Cholamidopropyl)dimethylammonio]-1-hydroxypropanesulfonic acid  
 Chenodeoxycholic acid  
 Cholate, Na<sup>+</sup>  
 Deoxycholate, Na<sup>+</sup>  
 Glycocholate, Na<sup>+</sup>  
 Glycodeoxycholate, Na<sup>+</sup>  
 Taurocholate, Na<sup>+</sup>  
 Taurodehydrocholate, Na<sup>+</sup>  
 Taurodeoxycholate, Na<sup>+</sup>  
 Cyclohexyl-n-ethyl-β-D-maltoside  
 Cyclohexyl-n-hexyl-β-D-maltoside  
 Cyclohexyl-n-methyl-β-D-maltoside  
 n-Decyl-β-D-maltopyranoside  
 n-Dodecyl-beta-D-maltopyranoside  
 n-Octyl-β-D-maltopyranoside  
 n-Undecyl-β-D-maltoside  
 N,N-Dimethyldecylamine oxide  
 Genaminox KC  
 N,N-Dimethyldodecylamine oxide  
 N-Dodecyl-N,N-(dimethylammonio)butyrate  
 N-Dodecyl-N,N-(dimethylammonio)undecanoate  
 n-Dodecyl-N,N-dimethylglycine  
 N-Octyl-N,N-dimethylammonio-3-propanesulfonate  
 N-Decyl-N,N-dimethylammonio-3-propanesulfonate  
 N-Dodecyl-N,N-dimethylammonio-3-propanesulfonate  
 N-Tetradecyl-N,N-dimethylammonio-3-propanesulfonate  
 Decanoysucrose  
 n-Dodecanoysucrose  
 Octanoysucrose  
 n-Decyl-β-D-glucopyranoside  
 Dodecyl-β-D-glucopyranoside  
 n-Heptyl-β-D-glucopyranoside  
 n-Hexyl-β-D-glucopyranoside  
 n-Nonyl-β-D-glucopyranoside

n-Octanoyl- $\beta$ -D-glucosylamine  
 n-Octyl-beta-D-glucopyranoside  
 n-Decyl- $\beta$ -D-thiomaltoside  
 n-Nonyl-beta-D-thiomaltopyranoside  
 N,N-Bis(3-D-gluconamidopropyl)deoxycholamide  
 N,N,-bis(3-D-gluconamidopropyl)cholamide  
 Digitonin  
 Bis(2-ethylhexyl)sodium sulfosuccinate  
 n-Dodecyl-N,N-dimethylglycine  
 6-O-(N-heptyl-carbamoyl)methyl- $\alpha$ -D-glucopyranoside  
 N-Dodecanoyl-N-methylglycine  
 Lauryl-sulfate Li<sup>+</sup>  
 Lauryl-sulfate, Na<sup>+</sup>  
 {3-([4-tert-Octyl]-1-propanesulfonic acid, Na<sup>+</sup>  
 n-Octanoyl-N-methylglucamide  
 n-Nonanoyl-N-methylglucamide  
 n-Decanoyl-N-methylglucamide  
 Ethylphenol-poly(ethylene glycol ether)s  
 n-Octyl-2-hydroxyethylsulfoxide  
 n-Octyl-2-hydroxyethyl sulfide  
 n-Octyl-rac-2,3-dihydroxypropylsulfone  
 n-octyl-rac-2,3-dihydroxypropylsulfoxide  
 Polyethylene glycol-polypropylene glycol copolymer  
 Pluronic F-127  
 $\beta$ -D-Fructopyranosyl- $\alpha$ -D-glucopyranoside monodecanoate  
 $\beta$ -D-Fructopyranosyl- $\alpha$ -D-glucopyranoside monododecanoate  
 PEG (9-10) nonylphenol  
 PEG (4.5) p-t-octylphenol  
 PEG (9-10) p-t-octylphenol  
 PEG (9-10) p-t-octylcyclohexyl  
 PEG (7-8) p-t-octylphenol  
 PEG (7-8) t-octylcyclohexyl



Plant protection agents can be:

<b>Herbicides</b>	<b>Insecticides</b>	<b>Fungicides</b>	<b>Other</b>
2,4-D	Abamectin	Acibenzolar	Chlormequat
2,4-DB	Acephate	Azoxystrobin	Chloropicrin
Acetochlor	Acequinocyl	Benalaxyl	Choline Chloride
Acifluorfen	Acetamiprid	Benomyl	Cyclanilide
Aclonifen	Acrinathrin	Bitertanol	Dazomet
Alachlor	Alanycarb	Bromuconazole	Dichlopropene
Alloxidim	Aldicarb	Bupirimate	Dikegulac
Ametryn	Alpha-cypermethrin	Captan	Dimethipin
Amidosulfuron	Amitraz	Carbendazim	Ethepon
Aminotriazole	Azinphos-methyl	Carboxin	Flumetralin
Anilofos	Azocyclotin	Carpropamid	Gibberellic acid
Asulam	Bacillus thuringiensis	Chlorothalonil	Inabenfide
Atrazine	Bendiocarb	Chlozolate	Maleic hydrazide
Azimsulfuron	Benfuracarb	Copper fungicides	Mepiquat
Benazolin	Bensultap	Cymoxanil	Metam
Benfluralin	Benzoximate	Cyproconazole	Methyl bromide
Benfuresate	Bifenazate	Cyprodinil	Methyl isothiocyanate
Bensulfuron	Bifentrin	Dichlofluanid	Paclobutrazol
Bentazone	BPMC (Fenobucarb)	Diclomezine	Prohexadione
Benzofenap	Bromopropylate	Diethofencarb	Thidiazuron
Bifenox	Buprofezin	Difenoconazole	Triapenthenol
Bilanafos	Cadusafos	Dimethirimol	Tributyl phosphorotri-thioate
Bispyribac-sodium	Carbaryl	Dimethomorp	Trinexapac-ethyl
Bromacil	Carbofuran	Diniconazole	Uniconazole
Bromobuthide	Carbosulfan	Dinocap	Fluthiacet - KIH 9201 / CGA 248757

Bromofenoxim	Cartap	Dithianon	
Bromoxynil	Chinomathionat	Dodemorph	
Butachlor	Chlorethoxyfos	Dodine	
Butamifos	Chlorfenapyr	Edifenphos	
Butralin	Chlorfenvinphos	Epoxiconazole	
Butroxydim	Chlorfluazuron	Ethaboxam	
Butylate	Chlormephos	Ethirimol	
Cafenstrole	Chloropirifos	Etridiazole	
Carbentamide	Clofentezine	Famoxadone	
Carfentrazone	Cycloprothirin	Fenarimol	
Chlorbromuron	Cyfluthrin	Fenbuconazole	
Chloridazon	Cyhexatin	Fenhexamid	
Chlorimuron	Cypermethrin	Fenitropan	
Chlorotoluron	Cyromazine	Fenpiclonil	
Chlorsulfuron	Deltamethrin	Fenpropidin	
Chlorthal	Demeton-s-methyl	Fenpropimorph	
Cinidon-ethyl	Diafenthiuron	Fentin	
Cinmethylin	Diazinon	Ferimzone	
Cinosulfuron	Dichlorvos	Fluazinam	
Clefoxydim	Dicofol	Fludioxonil	
Clethodim	Diclotophos	Fluoroimide	
Clodinafop	Diffubenzuron	Fluquinconazole	
Clomazone	Dimethoate	Flusilazole	
<b>Herbicides</b>	<b>Insecticides</b>	<b>Fungicides</b>	<b>PGR</b>
Clomeprop	Disolfoton	Flusulfamide	Aminoethoxy- vinylglycine
Clopyralid	Emamectin benzoate	Flutolanil	Prohydrojasmon - PDJ
Cloransulam-methyl	Endosulfan	Flutriafol	
Cumyluron	Esfenvalerate	Folpet	
Cyanazine	Ethiofencarb	Fosetyl	
Cyclosulfamuron	Ethion	Fuberidazole	

Cycloxidim	Ethoprophos	Furalaxyl	
Cyhalofop-butyl	Etofenprox	Furametpyr	
Daimuron	Etoxazole	Guazatine	
Desmedipham	Etrimfos	Hexaconazole	
Desmetryn	Fenamiphos	Hymexazol	
Dicamba	Fenazaquin	Imazalil	
Dichlobenil	Fenbutatin oxide	Imibenconazole	
Dichlorprp	Fenitrothion	Iminoctadine	
Diclofop	Fenothiocarb	Ipconazole	
Diclosulam	Fenoxycarb	Iprobenfos	
Difenzoquat	Fenprothrin	Iprodione	
Diiflufenican	Fenpyroximate	Iprovalicarb	
Diiflufenzopyr	Fenthion	Isoprothiolane	
Dimefuron	Fenvalerate	Kasugamycin	
Dimepiperate	Fipronil	Kresoxim-methyl	
Dimethachlor	Flubroythirinate	Mancozeb	
Dimethenamid	Flucycloxuron	Maneb	
Diphenamid	Flucythrinate	Mepanipyrin	
Diquat	Flufenoxuron	Mepronil	
Dithiopyr	Flutenzine	Metalaxyl	
Diuron	Fluvalinate	Metconazole	
Endothal	Formetanate	Methasulfocarb	
EPTC	Formothion	Metiram	
Esprocarb	Fosthiazate	Myclobutanil	
Ethalfuralin	Furathiocarb	Nitrothal- isopropyl	
Ethametsulfuron	Halfenbrox	Nuarimol	
Ethofumesate	Halofenozide	Oxadixyl	
Ethoxyfen	Hexaflumuron	Oxine-copper	
Ethoxysulfuron	Hexythiazox	Oxolinic acid	
Etobenzanid	Imidacloprid	Oxycarboxin	
Fenoxaprop	Indoxacarb	Pefurazoate	

Flamprop-M	Isofenphos	Penconazole	
Flazasulfuron	Isoprocarb	Pencycuron	
Fluazifop	Isoxathion	Phthalide	
Flufenacet	Lambda-cyhalothrin	Probenazole	
Flumetsulam	Lindane (Gamma-HCH)	Prochloraz	
Flumiclorac-pentyl	Lufenuron	Procymidone	
Flumioxazin	Malathion	Propamocarb	
Fluometuron	Metaldehyde	Propiconazole	
Fluoroglycofen	Methamidophos	Propineb	
Flupoxam	Methidathion	Pyrazophos	
Flupyrsulfuron	Methiocarb	Pyrifenox	
<b>Herbicides</b>	<b>Insecticides</b>	<b>Fungicides</b>	<b>Nematicides</b>
Flurenol	Methomyl	Pyrimethanil	ZA3274
Fluridone	Methoprene	Pyroquilon	
Flurochloridone	Methoxyfenozide	Quinoxifen	
Fluroxypyr	Mevinphos	Quintozone	
Flurtamone	Milbemectin	Spiroxamine	
Fomesafen	Monocrotophos	Streptomycin	
Glufosinate	Nitenpyram	Sulfur	
Glyphosate	Novaluron	Tebuconazole	
Halosulfuron	Omethoate	Tecloftalam	
Haloxypyr	Oxamyl	Tetraconazole	
Imazamethabenz	Oxydemeton-methyl	Thiabendazole	
Imazamox	Parathion	Thielfluzamide	
Imazapic	Parathion-methyl	Thiophanate methyl	
Imazapyr	Permethrin	Thiram	
Imazaquin	Phenthoate	Tolclofos-methyl	
Imazethapyr	Phorate	Tolylfluanid	
Imazosulfuron	Phosalone	Triadimefon	
Isoprothuron	Phosmet	Triadimenol	

Isoxaben	Phosphamidon	Tricyclazole	
Isoxaflutole	Phoxim	Tridemorph	
Lactofen	Pirimicarb	Triflumizole	
Lenacil	Pirimiphos-ethyl	Triforine	
Linuron	Pirimiphos-methyl	Triticonazole	
MCPA	Profenofos	Validamycin	
MCPA-thioethyl	Propaphos	Vinclozolin	
MCPB	Propargite	Zineb	
Mecoprop	Propoxur	Ziram	
Mefenacet	Prothiofos	Cyamidazosulf- amid - IKF-916	
Metamitron	Pymetrozine		
Metazachlor	Pyraclofos	Cyamidazosulf- amid- IKF-916	
Methabenzthiazuron	Pyridaben		
Methyl-arsonic acid	Pyridafenthion	Diclocymet - S2900	
Metobromuron	Pyrimidifen	Fenamidone - RPA 407213	
Metolachlor	Pyriproxyfen		
Metosulam	Quinakphos	Fenoxanil - AC382042 /NNF9425	
Metoxuron	Silafluofen		
Metribuzin	Spinosad	Iprovalicarb- SZX722	
Metsulforon	Sulprofos	MA 565	
Molinate	Tebufenozide	Metominostrobin - SSF-126	
Naproanilide	Tebufenpyrad		
Napropamide	Tebupirimfos	MTF-753	
Naptalam	Teflubenzuron	NF-149	
Nicosulfuron	Tefluthrin	NNF-9850	
Norflurazon	Terbufos	Oxpoconazole fumarate - UBF-	

		910	
Orbencarb	Thiamethoxam		
Oryzalin	Thiocyclam	Picoxystrobin - ZA1963	
Oxadiargyl	Thiodicarb		
Oxadiazon	Thiometon		
<b>Herbicides</b>	<b>Insecticides</b>	<b>Fungicides</b>	
Oxasulfuron	Tralomethrin	Silthiopharm - MON-65500	
Oxyfluorfen	Triazamate		
Paraquat	Triazophos	Simeconazole - F155	
Pendimethalin	Trichlorfon	Trifloxystrobin - OGA279202	
Pentoxazone	Triflumuron		
Phenmedipham	Vamidothion	Zoxamide - RH7281	
Picloram	Xylyl methylcarbamate		
Pretilachlor	Zeta-Cypermethrin		
Primisulfuron	Acetoprole-RPA115782		
Prometryn	<b>AKD 1022</b>		
Propachlor	Chromafenozide- ANS- 118		
Propanil			
Propaquizafop	Clothianidin - TI-435		
Propazine	Dinitofuran – MTI-446		
Propyzamide	Ethiprole–RPA 107382		
Prosulfocarb	Fluacrypyrim – NA-83		
Prosulfuron	Flupyrzofos		
Pyraflufen-ethyl	Phosphocarb – BAS301		
Pyrazolate			
Pyrazosulfuron	Protrifenbute - FMC 111869		
Pyrazoxyfen			

Pyribenzoxim	Thiacloprid - BAYYRC2894	
Pyributicarb		
Pyridate	Tolfenpyrad – OMI-88	
Pyriminobac-methyl		
Pyrithiobac		
Quinclorac		
Quinmerac		
Quinoclamine		
Quizalofop		
Quizalofop-P-tefuryl		
Rimsulfuron		
Sethoxydim		
Simazine		
Sulcotrione		
Sulfentrazone		
Sulfometuron		
Sulfosate		
Sulfosulfuron		
Tebuthiuron		
Terbacil		
Terbumeton		
Terbuthylazine		
Terbutryn		
Thenylchlor		
Thiazopyr		
Thifensulfuron		
Thiobencarb		
<b>Herbicides</b>		
Tralkoxydim		
Triallate		
Triasulfuron		

Tribenuron
Triclopyr
Trifluralin
Triflusulfuron
Amicarbazone-BAYMKH3586
Azafenidin-DPX-R6447
Beflubutamid-UBH-820
Benzfendizone – FMC 143686
Benzobicyclon –SB-500
Butafenacil – CGA 276854
Fentrazamide – BAYYRC2388
Florasulam – DE570
Fluazolate – JV485
Flucarbazone – BAYMKH6562
Flufebpyr-ethyl – S-3453
Foramsulfuron - AEF 130360
Indanofan – MK-243
Iodosulfuron – AEF 115008
Isoxadifen –AEF122006
KPP421
Mesosulfuron – AEF 130060
Mesotrione – ZA1296
MTB-951
OK-9701
Oxaziclomefone–MY-00
Penoxsulam – DE638
Pethoxamid – TKC-94
Picolinofen – AC900001
Propoxycarbazone (proposed) BAYMKH6561
Pyriftalid – CGA279233
Tepraloxydim - BAS620H/NP61EC



Triaziflam – IDH 1105
Trifloxysulfuron (Na salt) - CGA362622
Tritosulfuron

[00037] Preferably, however, the silicon dioxide granules employed according to the invention function as a carrier. The present invention therefore also relates to an adsorbate of the silicon dioxide granules described above and at least one of these substances.

[00038] The term "adsorbate" as used herein includes the adsorption of a substance not only on to the surface of the silicon dioxide, but also into the pores, as well as the "intercalation" into the intergrain volumes. "Adsorbate" can also mean that silicon dioxide granules or fragments thereof envelop solid particles or liquid droplets of the substance. In the latter case the forces of attraction between the particles or droplets are reduced and, for example, the flow properties are improved or the merging of droplets is impeded.

[00039] The ratio of amounts of substance to silicon dioxide granules in the adsorbate can be chosen as desired as a function of the properties of the substance and the requirements for the end product. Preferably, however, 0.001 to 200 g of substance are employed per 100 g of silicon dioxide granules, particularly preferably 10 to 150 g.

[00040] In a preferred embodiment, granules based on pyrogenically prepared silicon dioxide of average particle diameter from 10 to 120  $\mu\text{m}$  and BET surface area from 40 to 400  $\text{m}^2/\text{g}$  (determination in accordance with DIN 66 131 with nitrogen) can be used as the silicon dioxide granules.

**[00041]** The silicon dioxide granules furthermore preferably have the following physico-chemical characteristic data, which are determined as described in EP PS 0 725 037:

Pore volume: 0.5 to 2.5 ml/g

Pore size volume: less than 5% of the total pore volume has a pore diameter of less than 5 nm, remainder meso- and macropores

pH: 3.6 to 8.

Tamped density: 220 to 700 g/l.

**[00042]** Granules which are suitable for the use according to the invention and the preparation thereof are described, for example, in EP OS 0 727 037.

**[00043]** An example of a process for the preparation of the adsorbate according to the invention comprises:

**[00044]** Melting of the substance(s) to be adsorbed, chosen from foodstuffs additives, such as dyestuffs, antioxidants, preservatives, emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives, chemical intermediates and plant protection agents, such as, for example, herbicides, insecticides and fungicides, or distribution, i.e. dissolving, suspending or emulsifying, thereof in a solvent;

**[00045]** mixing of the granules based on pyrogenically prepared silicon dioxide with the mixture from step (a); and where appropriate removal of the solvent.

**[00046]** "Solvent" also includes mixtures of several different solvents. It goes without saying, furthermore, that substances which are already liquid at room temperature can be subjected to the mixing in step (b) without prior processing, since in this case the "melting operation" has already taken place. Mixing step (b) can be carried out either by adding the

mixture from step (a) to the silicon dioxide granules, for example by spraying on, or vice versa. In both cases, the addition can be made in one amount or in portions. The duration of the mixing in step (b) depends here above all on the adsorption properties of the substance to be adsorbed on the silica surface. If a solvent is present, step (a) and (b) are carried out at a temperature which lies between the freezing and boiling point of the solvent. The solvent, where appropriate in excess, is preferably removed in step (c) at elevated temperature and/or under reduced pressure.

**[00047]** The removal of the solvent in step (c) can also be carried out by spray drying or fluidized bed drying, shaping taking place at the same time. In the case of a granule-containing melt, the shaping process can accordingly be an extrusion.

**[00048]** The adsorbates according to the invention can be used for the preparation of powders, liquids, foams, sprays, gels, creams, ointments, pastes, sticks and tablets.

**[00049]** The adsorbates according to the invention can additionally be shaped. They can be processed, for example, to pellets, larger granules, extrudates etc.

**[00050]** The advantage of the adsorbates according to the invention lies in their excellent flow properties, the low water content and the high purity of the starting granules. They offer a very good possibility for dispersing substances which are difficult to meter, and are easy to handle.

**[00051]** When handling the adsorbates, the hazard potential to the administering person during use on toxic substances, such as plant protection agents or aggressive skin-irritating substances, can be reduced significantly.

**[00052]** When the adsorbate according to the invention is used, a uniform distribution of the active compound can be achieved.

[00053] The invention is now to be explained in more detail with the aid of examples.

#### Preparation of granules based on pyrogenically prepared silicon dioxide

[00054] The pyrogenically prepared silicon dioxide AEROSIL 300, commercially obtainable from Degussa AG, is used as the starting compound.

[00055] The pyrogenically prepared silicon dioxide is dispersed in completely demineralized water. A dispersing unit which operates by the rotor/stator principle is used here. The suspension formed is spray dried. The finished product is separated off via a filter or cyclone. The heat treatment of the spray granules is carried out in a muffle oven.

[00056] The preparation parameters are shown in table 1.

**Table 1**

Starting SiO <sub>2</sub>	AEROSIL 300
Spray drying data	
Amount of H <sub>2</sub> O (kg)	100
Amount of SiO <sub>2</sub> (kg)	10
Atomization with	disc atomizer
Operating temperature (°C)	480°C
Waste air temperature (°C)	103°C
Separation	filter
Physico-chemical data	
BET surface area (m <sup>2</sup> /g)	298
Particle size d <sup>50</sup> (µm)	30
Tamped volume (g/l)	283
pH	4.7

## Examples

### 1. Starting materials

#### 1.1 Model liquids

**[00057]** Vitamin E acetate, silicone oil, paraffin oil and eucalyptus oil are used as model liquids for the fields of use according to the invention. Vitamin E acetate is used, for example, in the nutrition of animals and humans, and eucalyptus oil as an aromatic or aroma substance.

Example	Product	Product name	Manufacturer
1	Vitamin E acetate		BASF
2	Silicone oil	Silicon Fluid 345	Dow Corning
3	Paraffin oil	Paraffinöl dünnflüssig	Merck
4	Eucalyptus oil	Oleum Eucalypti 80-85%	Caelo

#### 1.2 Carrier silicas

Silica	Loss on drying (wt.%)	Loss on ignition (wt.%)	SiO <sub>2</sub> content (wt.%)	Slope angle (°)	Bulk density (g/l)
Example 1-4 AEROPERL® 300/30 (Degussa)	1.7	2.1	99.9	34.97	232.8
Comparison example 1 SIPERNAT® 22 (Degussa)	4.8	4.4	98.0	38.99	211
Comparison example 2 SIPERNAT® 50 (Degussa)	4.5	4.9	98.5	52.67	136.67
Comparison example 3 Syloid 244 FP (Grace)	5.9	3.9	nd	50	92

[00058] Granulated pyrogenic silica (AEROPERL® 300/30) has a significantly lower water content (loss on drying and ignition) and a higher silicon dioxide content than the silicas used in the comparison examples. Furthermore, it is free from sulfates, typical impurities of precipitated silica and silica gels, and has the best flowability (the lowest slope angle).

## 2. Procedure:

[00059] 50 g of carrier silica are initially introduced into a 2 litre three-necked flask equipped with a blade stirrer. 50 g of the model liquids from examples 1-4 are added dropwise from a dropping funnel in the course of 60 minutes, while stirring at a stirrer speed of 100 revolutions / minute. Comparison examples 1-3 are carried out with eucalyptus oil. The liquid-silica adsorbates are then sieved manually three times through a 0.8 mm sieve and left to stand overnight in a closed screw-cap glass bottle. The following day, the liquid-silica adsorbates are characterized by the following methods:

Flow rating by means of glass flow vessels in accordance with the publication series Pigmente No. 31 "AEROSIL zur Verbesserung des Fließverhaltens pulverförmiger Substanzen", Degussa AG, Düsseldorf.

Poured cone height (cm) or slope angle (°) in accordance with the publication series Pigmente No. 31. The slope angle is obtained from the poured cone height via the equation

$$\tan(\text{slope angle}) = (\text{poured cone height} / 0.5 \text{ cone diameter})$$

Bulk density (g/l) in accordance with DIN standard 6613.

### 3. Results

	Flow rating	Slope angle (°)	Bulk density (g/l)
Example 1 AEROPERL / Vitam. E	2	30.1	501
Example 2 AEROPERL / Silicone oil	2	37.2	475
Example 3 AEROPERL / Paraffin oil	2	38.7	497
Example 4 AEROPERL / Eucalyptus oil	2	37.2	594
Comparison example 1 SIPERNAT 22	3	46.0	450
Comparison example 2 SIPERNAT 50	4	63.9	353
Comparison example 3 Syloid FP 244	6	56.7	201

[00060] The liquid-silica adsorbates prepared with granulated pyrogenic silica (AEROPERL<sup>®</sup> 300/30) are distinguished by a good flowability (flow rating 2, slope angle < 40°C). In contrast, the liquid-silica adsorbates from comparison examples 1 to 3 show a significantly lower flowability. The latter moreover have significantly lower bulk densities.

[00061] Liquid-silica adsorbates with a good flowability and high bulk volume are advantageous for carrier uses. Furthermore, carrier silicas should have the lowest possible water content and should be very pure, in order to avoid decomposition of the adsorbed liquids under the (catalytic) influence of water or impurities, such as, for example, sulfates. The experiments show that granulated pyrogenic silica meets all these requirements.